

1 1. A method for forming an implant having an inner core and an outer layer which
2 comprises:

3 fabricating a preform with an open pore network;

4 coating at least a portion of the outer layer of the preform with a fugitive material to
5 form an inhibition layer;

6 infusing selected regions of the inner core with at least one infusing media;

7 forming an interpenetrating phase composite in the inner core; and

8 removing the fugitive material from the outer layer thereby forming a porous outer
9 layer.

1 2. The method of claim 1 wherein the preform is fabricated by sintering.

1 3. The method of claim 2 wherein the preform comprises a material selected from
2 the group consisting of hydroxyapatite, bioactive glass, calcium phosphates, xenografts,
3 allografts, autografts, isografts, ultrahigh density zirconia, zirconia toughened alumina, alumina,
4 sapphire, titanium and gold/palladium alloys.

1 4. The method of claim 1 wherein the fugitive material is selected from the group
2 consisting of polyethylene glycol, waxes, hydrogels, acrylic latexes, and other water-soluble or
3 water-dispersible materials.

1 5. The method of claim 1 wherein the infusion media is selected from the group
2 consisting of acrylates including TEGDMA, MMA, Bis GMA; thermoplastics including

3 styrene, vinyl acetate, vinyl chloride, polyethylene, PTFE, polypropylene); epoxies
4 (polyetherketone, polyetheretherketone, polyphenylene oxide) ; resorbable polymers including
5 polylactic acid, polyglycolic acid, polycaprolactone, polytrimethylene carbonate,
6 polydioxanone, polyiminocarbonates, polyamides, polyorthoesters, polyanhydrides,
7 polyhydroxyalkanoates, polyhydroxybutyrate); water soluble/hydrophilics including polyvinyl
8 alcohol, PVA-based mixtures, collagen gel/poly(alpha hydroxyacids, cellulose and waxes.

1 6. The method of claim 5 which comprises:
2 infusing the inner core with at least two infusion media.

1 7. The method of claim 5 which comprises:
2 infusing the inner core with an inorganic material selected from the group consisting of
3 resorbable glasses and silica.

1 8. The method of claim 5 which comprises:
2 infusing the inner core with a material selected from the group consisting of drug
3 molecules, growth factors, adhesion peptides, promoters and activators.

1 9. The method of claim 5 which comprises:
2 infusing the inner core with inorganic precursors selected from the group consisting of
3 alkoxides, metal alkoxides, silicon alkoxides, non-silicate tetravalent metal alkoxides and sol-gel
4 organic-inorganic hybrids.

1 10. The method of claim 11 which comprises:

2 removing the fugitive material.

1 11. An implant which comprises:

2 a preform with an open pore network, the preform having an inner core and an outer
3 layer, the inner core infused with a polymer which forms an interpenetrating phase composite
4 in the inner core, the preform characterized by a flexural strength, a modulus and a fracture
5 toughness which generally matches that of a target bone host, and at least a portion of the outer
6 layer characterized by a defined porosity.

1 12. The implant of claim 11 wherein the preform is comprised of a material selected
2 from the group consisting of hydroxyapatite, bioactive glass, calcium phosphates, xenografts,
3 allografts, autografts, isografts, ultrahigh density zirconia, zirconia toughened alumina, alumina,
4 sapphire, titanium and gold/palladium alloys.

1 13. The implant of claim 11 wherein the fugitive material is selected from the group
2 consisting of polyethylene glycol, waxes, hydrogels, acrylic latexes, and other water-soluble or
3 water-dispersible materials.

1 14. The implant of claim 11 wherein the infusion media is selected from the group
2 consisting of acrylates including TEGDMA, MMA, Bis GMA; thermoplastics including
3 styrene, vinyl acetate, vinyl chloride, polyethylene, PTFE, polypropylene); epoxies

4 (polyetherketone, polyetheretherketone, polyphenylene oxide) ; resorbable polymers including
5 polylactic acid, polyglycolic acid, polycaprolactone, polytrimethylene carbonate,
6 polydioxanone, polyiminocarbonates, polyamides, polyorthoesters, polyanhydrides,
7 polyhydroxyalkanoates, polyhydroxybutyrate); water soluble/hydrophilics including polyvinyl
8 alcohol, PVA-based mixtures, collagen gel/poly(alpha hydroxyacids, cellulose and waxes.

1 15. The implant of claim 11 wherein the inner core is infused with at least two
2 infusion media.

1 16. The implant of claim 14 wherein the inner core is infused with an inorganic
2 material selected from the group consisting of resolvable glasses and silica.

1 17. The implant of claim 14 wherein the inner core is infused with a material selected
2 from the group consisting of drug molecules, growth factors, adhesion peptides, promoters and
3 activators.

1 18. The implant of claim 14 wherein the inner core is infused with inorganic
2 precursors selected from the group consisting of alkoxides, metal alkoxides, silicon alkoxides,
3 non-silicate tetravalent metal alkoxides and sol-gel organic-inorganic hybrids.